

EXHIBIT NO. 3

CONSUMERS ILLINOIS WATER COMPANY

DOCKET NO. \_\_\_\_\_

EXHIBIT

TO ACCOMPANY THE

DIRECT TESTIMONY

OF

PAULINE M. AHERN, CRRA  
VICE PRESIDENT  
AUS CONSULTANTS - UTILITY SERVICES

CONCERNING

COMMON EQUITY COST RATE

MAY 2003

Consumers Illinois Water Company  
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to the Supporting Financial Exhibit  
of Pauline M. Ahern

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Consumers Illinois Water Company  
Summary of Cost of Capital and Fair Rate of Return  
Based upon an Average Capital Structure Estimated for the Test Year Ended December 31, 2004

<u>Type of Capital</u>	<u>Ratios (1)</u>	<u>Cost Rate</u>	<u>Weighted Cost Rate</u>	<u>Before-Income Tax Weighted Cost Rate (2)</u>
Long-Term Debt	47.62 %	7.90 % (1)	3.760 % (1)	3.760 %
Short-Term Debt	<u>1.61</u>	3.25 (1)	<u>0.052 (1)</u>	<u>0.052</u>
Total Debt	49.23		3.812	3.812
Preferred Stock	0.35	5.48 (1)	0.019 (1)	0.031
Common Equity	<u>50.43</u>	12.50 (3)	<u>6.304</u>	<u>10.449</u>
Total	<u>100.01 % (4)</u>		<u>10.135 %</u>	<u>14.292 %</u>

Before-income tax interest coverage of all  
interest charges ( 14.292% / 3.812% )

3.75 x

Notes:

- (1) From Schedule D -1, page 1.
- (2) Based upon a company-provided combined effective statutory federal and state income tax rate of 39.67%.
- (3) Based upon informed judgment from the entire study, the principal results of which are summarized on page 2 of this Schedule.
- (4) Does not add due to rounding.

Consumers Illinois Water Company  
Brief Summary of Common Equity Cost Rate

No.	Principal Methods	Proxy Group of Seven C. A. Turner Water Companies	Proxy Group of Thirteen Utilities Selected on the Basis of Least Relative Distance
1.	Discounted Cash Flow Model (DCF) (1)	10.1 %	10.6 %
2.	Risk Premium Model (RPM) (2)	12.4	12.7
3.	Capital Asset Pricing Model (CAPM) (3)	12.3	12.9
4.	Comparable Earnings Model (CEM) (4)	13.6	13.3
5.	Indicated Common Equity Cost Rate before Adjustment for Business Risk	12.1 %	12.4 %
6.	Business Risk Adjustment	0.25	0.35
7.	Indicated Common Equity Cost Rate after Adjustment for Business Risk	12.35 %	12.75 %
8.	Recommendation	12.50%	

Notes: (1) From Schedule 7 of this Exhibit.  
(2) From page 1 of Schedule 13 of this Exhibit.  
(3) From page 1 of Schedule 14 of this Exhibit.  
(4) From page 1 of Schedule 15 of this Exhibit.

Consumers Illinois Water Company  
Derivation of Investment Risk Adjustment Based upon  
Ibbotson Associates' Size Premium for the Decile Portfolios of the NYSE/AMEX/NASDAQ

Line No.	1	2	3	4	5
	Total Capitalization (incl. Short-Term Debt) for the Year 2001 (millions) (times larger)	Market Capitalization on April 30, 2003 (1) (millions) (times larger)	Applicable Decile of the NYSE/AMEX/NASDAQ	Applicable Size Premium	Spread from Applicable Size Premium for Consumers Illinois Water Co. (2)
1. <u>Consumers Illinois Water Company</u>	\$ 94.396 (3)				
A. <u>Based upon the Proxy Group of Seven C. A. Turner Water Companies</u>		\$ 101.475	9 - 10 (4)	4.12% (5)	
B. <u>Based upon the Proxy Group of Thirteen Utilities Selected on the Basis of Least Relative Distance</u>		\$ 102.720	9 - 10 (4)	4.12% (5)	
2. <u>Proxy Group of Seven C. A. Turner Water Companies</u>	\$ 355.612 (6) 3.8 x	\$ 391.994 3.9 x	7 - 8 (7)	1.71% (8)	2.41%
3. <u>Proxy Group of Thirteen Utilities Selected on the Basis of Least Relative Distance</u>	\$ 4,317.115 (9) 45.7	\$ 3,236.257 31.5	3 (10)	0.66% (11)	3.46%

Decile	Number of Companies	Recent Total Market Capitalization (millions)	Recent Average Market (millions)
1 - Largest	168	\$6,089,523.614	\$36,306.688
2	182	1,174,194.524	6,451.618
3	197	584,693.698	2,967.988
4	200	344,651.829	1,723.259
5	244	282,480.634	1,157.749
6	268	206,453.954	770.351
7	348	175,969.268	505.659
8	427	136,629.517	319.975
9	703	117,578.857	167.253
10 - Smallest	1994	81,984.379	41.116

See page 4 for notes.

Consumers Illinois Water Company  
Derivation of Investment Risk Adjustment Based upon  
Ibbotson Associates' Size Premia for the Decile Portfolios of the NYSE

Notes:

- (1) From page 5 of this Schedule.
- (2) Line No. 1 – Line No. 2 and Line No. 1 – Line No. 3 of Columns 3 and 4, respectively. For example, the 2.41% in Column 5, Line No. 2 is derived as follows  $2.41\% = 4.12\% - 1.71\%$ .
- (3) From page 1 of Schedule 3 of this Exhibit.
- (4) With an estimated market capitalization of \$101.3475 million (based upon the proxy group of seven C. A. Turner water companies) / \$102.6720 (based upon the proxy group of thirteen utilities selected on the basis of least relative distance), Consumers Illinois Water Company falls between the 9<sup>th</sup> and 10<sup>th</sup> deciles of the NYSE/AMEXNASDAQ which have an average market capitalization of \$104.185 million as can be gleaned from the information shown in the table on the bottom half of page 3 of this Schedule.
- (5) Average size premium applicable to the 9<sup>th</sup> and 10<sup>th</sup> deciles of the NYSE/AMEXNASDAQ derived from the information shown on page 15 of this Schedule.
- (6) From page 1 of Schedule 4 of this Exhibit.
- (7) With an estimated market capitalization of \$391.994 million, the proxy group of seven C. A. Turner water companies falls between the 7<sup>th</sup> and 8<sup>th</sup> deciles of the NYSE/AMEXNASDAQ which have an average market capitalization of \$412.817 million as can be gleaned from the information shown in the table on the bottom half of page 3 of this Schedule.
- (8) Average size premium applicable to the 7<sup>th</sup> and 8<sup>th</sup> deciles of the NYSE/AMEXNASDAQ derived from the information shown on page 15 of this Schedule.
- (9) From page 1 of Schedule 5 of this Exhibit.
- (10) With an estimated market capitalization of \$3,236.257 million, the proxy group of thirteen utilities selected on the basis of least relative distance falls in the 3<sup>rd</sup> decile of the NYSE/AMEXNASDAQ which has an average market capitalization of \$2,967.988 million as shown in the table on the bottom half of page 3 of this Schedule.
- (11) Size premium applicable to the 3<sup>rd</sup> decile of the NYSE/AMEXNASDAQ as shown on page 16 of this Schedule.

Source of information: Standard & Poor's Computer Services, Inc., PC Plus Research Institute Data Base Annual Forms 10-K

[illegible]

Notes: (1) Column 3 / Column 1.

NA = Not Available

[illegible]

Stocks, Bonds, Bills,  
and Inflation

**SBBI**

**Valuation Edition**  
2003 Yearbook

**Ibbotson** Associates



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# Chapter 7

## Firm Size and Return

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### The Firm Size Phenomenon

One of the most remarkable discoveries of modern finance is that of a relationship between firm size and return. The relationship cuts across the entire size spectrum but is most evident among smaller companies, which have higher returns on average than larger ones. Many studies have looked at the effect of firm size on return.<sup>1</sup> In this chapter, the returns across the entire range of firm size are examined.

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### Construction of the Decile Portfolios

The portfolios used in this chapter are those created by the Center for Research in Security Prices (CRSP) at the University of Chicago's Graduate School of Business. CRSP has refined the methodology of creating size-based portfolios and has applied this methodology to the entire universe of NYSE/AMEX/NASDAQ-listed securities going back to 1926.

The New York Stock Exchange universe excludes closed-end mutual funds, preferred stocks, real estate investment trusts, foreign stocks, American Depositary Receipts, unit investment trusts, and Americus Trusts. All companies on the NYSE are ranked by the combined market capitalization of their eligible equity securities. The companies are then split into 10 equally populated groups, or deciles. Eligible companies traded on the American Stock Exchange (AMEX) and the Nasdaq National Market (NASDAQ) are then assigned to the appropriate deciles according to their capitalization in relation to the NYSE breakpoints. The portfolios are rebalanced, using closing prices for the last trading day of March, June, September, and December. Securities added during the quarter are assigned to the appropriate portfolio when two consecutive month-end prices are available. If the final NYSE price of a security that becomes delisted is a month-end price, then that month's return is included in the quarterly return of the security's portfolio. When a month-end NYSE price is missing, the month-end value of the security is derived from merger terms, quotations on regional exchanges, and other sources. If a month-end value still is not determined, the last available daily price is used.

Base security returns are monthly holding period returns. All distributions are added to the month-end prices, and appropriate price adjustments are made to account for stock splits and dividends. The return on a portfolio for one month is calculated as the weighted average of the returns for its individual stocks. Annual portfolio returns are calculated by compounding the monthly portfolio returns.

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### Size of the Deciles

Table 7-1 reveals that the top three deciles of the NYSE/AMEX/NASDAQ account for most of the total market value of its stocks. Approximately two-thirds of the market value is represented by the first decile, which currently consists of 168 stocks, while the smallest decile accounts for less than one percent of the market value. The data in the second column of Table 7-1 are averages across all

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<sup>1</sup> Rolf W. Banz was the first to document this phenomenon. See Banz, Rolf W. "The Relationship Between Returns and Market Value of Common Stocks," *Journal of Financial Economics*, Vol. 9, 1981, pp. 3-18.

77 years. Of course, the proportion of market value represented by the various deciles varies from year to year.

Columns three and four give recent figures on the number of companies and their market capitalization, presenting a snapshot of the structure of the deciles near the end of 2002.

Table 7-1

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ Size and Composition  
1926-2002

Decile	Historical Average Percentage of Total Capitalization	Recent Number of Companies	Recent Decile Market Capitalization (in thousands)	Recent Percentage of Total Capitalization
1-Largest	63.27%	168	\$6,099,523,614	66.27%
2	14.01%	182	1,174,194,524	12.76%
3	7.60%	197	584,693,698	6.35%
4	4.75%	200	344,651,829	3.74%
5	3.25%	244	282,490,634	3.07%
6	2.37%	268	206,453,954	2.24%
7	1.72%	347	175,969,268	1.91%
8	1.27%	427	136,629,517	1.48%
9	0.97%	703	117,578,857	1.28%
10-Smallest	0.79%	1,994	81,984,379	0.89%
Mid-Cap 3-5	15.59%	641	1,211,836,161	13.17%
Low-Cap 6-8	5.36%	1,042	519,052,738	5.64%
Micro-Cap 9-10	1.76%	2,697	199,563,236	2.17%

Source: Center for Research in Security Prices, University of Chicago.

Historical average percentage of total capitalization shows the average, over the last 77 years, of the decile market values as a percentage of the total NYSE/AMEX/NASDAQ calculated each month. Number of companies in deciles, recent market capitalization of deciles, and recent percentage of total capitalization are as of September 30, 2002.

Table 7-2 gives the current breakpoints that define the composition of the NYSE/AMEX/NASDAQ size deciles. The largest company and its market capitalization are presented for each decile. Table 7-3 shows the historical breakpoints for each of the three size groupings presented throughout this chapter. Mid-cap stocks are defined here as the aggregate of deciles 3-5. Based on the most recent data (Table 7-2), companies within this mid-cap range have market capitalizations at or below \$5,012,705,000 but greater than \$1,143,845,000. Low-cap stocks include deciles 6-8 and currently include all companies in the NYSE/AMEX/NASDAQ with market capitalizations at or below \$1,143,845,000 but greater than \$314,042,000. Micro-cap stocks include deciles 9-10 and include companies with market capitalizations at or below \$314,042,000. The market capitalization of the smallest company included in the micro-capitalization group is currently \$501 thousand.

Table 7-2

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, Largest Company and Its Market Capitalization by Decile  
September 30, 2002

Decile	Market Capitalization of Largest Company (in thousands)	Company Name
1-Largest	\$293,137,304	Microsoft Corp.
2	11,628,735	KeyCorp New
3	5,012,705	Rockwell Collins Inc.
4	2,680,573	Diebold Inc.
5	1,691,210	Smucker JM Co.
6	1,143,845	CEC Entertainment Inc.
7	791,336	Playtex Products Inc.
8	521,298	Buckle Inc.
9	314,042	Guess? Inc.
10-Smallest	141,459	NYMAGIC Inc.

Source: Center for Research in Security Prices, University of Chicago.

### Presentation of the Decile Data

Summary statistics of annual returns of the 10 deciles over 1926-2002 are presented in Table 7-4. Note from this exhibit that both the average return and the total risk, or standard deviation of annual returns, tend to increase as one moves from the largest decile to the smallest. Furthermore, the serial correlations of returns are near zero for all but the smallest two deciles. Serial correlations and their significance will be discussed in detail later in this chapter.

Graph 7-1 depicts the growth of one dollar invested in each of three NYSE/AMEX/NASDAQ groups broken down into mid-cap, low-cap, and micro-cap stocks. The index value of the entire NYSE/AMEX/NASDAQ is also included. All returns presented are value-weighted based on the market capitalizations of the deciles contained in each subgroup. The sheer magnitude of the size effect in some years is noteworthy. While the largest stocks actually declined in 1977, the smallest stocks rose more than 20 percent. A more extreme case occurred in the depression-recovery year of 1933, when the difference between the first and tenth decile returns was far more substantial. This divergence in the performance of small and large company stocks is a common occurrence.

Table 7-3

**Size-Decile Portfolios of the NYSE/AMEX/NASDAQ**  
Largest and Smallest Company by Size Group

from 1926 to 1965

Date (Sept 30)	Capitalization of Largest Company (in thousands)			Capitalization of Smallest Company (in thousands)		
	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10
1926	\$61,480	\$14,040	\$4,305	\$14,100	\$4,325	\$43
1927	\$65,281	\$14,746	\$4,450	\$15,311	\$4,496	\$72
1928	\$81,998	\$18,975	\$5,074	\$19,050	\$5,119	\$135
1929	\$107,085	\$24,328	\$5,875	\$24,480	\$5,915	\$126
1930	\$67,808	\$13,050	\$3,219	\$13,068	\$3,264	\$30
1931	\$42,607	\$8,142	\$1,905	\$8,222	\$1,927	\$15
1932	\$12,431	\$2,170	\$473	\$2,198	\$477	\$19
1933	\$40,298	\$7,210	\$1,830	\$7,280	\$1,875	\$100
1934	\$38,129	\$6,669	\$1,669	\$6,734	\$1,673	\$68
1935	\$37,631	\$6,519	\$1,350	\$6,549	\$1,383	\$38
1936	\$46,920	\$11,505	\$2,660	\$11,526	\$2,668	\$98
1937	\$51,750	\$13,601	\$3,500	\$13,635	\$3,539	\$68
1938	\$36,102	\$8,325	\$2,125	\$8,372	\$2,145	\$60
1939	\$35,784	\$7,367	\$1,687	\$7,389	\$1,800	\$75
1940	\$31,050	\$7,990	\$1,861	\$8,007	\$1,872	\$51
1941	\$31,744	\$8,316	\$2,086	\$8,336	\$2,087	\$72
1942	\$26,135	\$6,870	\$1,779	\$6,875	\$1,788	\$82
1943	\$43,218	\$11,475	\$3,847	\$11,480	\$3,903	\$395
1944	\$46,621	\$13,066	\$4,800	\$13,068	\$4,812	\$309
1945	\$55,268	\$17,325	\$6,413	\$17,575	\$6,428	\$225
1946	\$79,158	\$24,192	\$10,013	\$24,199	\$10,051	\$829
1947	\$57,830	\$17,735	\$6,373	\$17,872	\$6,380	\$747
1948	\$67,236	\$19,575	\$7,313	\$19,651	\$7,329	\$784
1949	\$55,506	\$14,549	\$5,037	\$14,577	\$5,106	\$379
1950	\$66,881	\$18,675	\$6,176	\$18,750	\$6,201	\$303
1951	\$82,517	\$22,750	\$7,567	\$22,860	\$7,598	\$668
1952	\$97,936	\$25,452	\$8,428	\$25,532	\$8,480	\$480
1953	\$98,695	\$25,374	\$8,156	\$25,395	\$8,168	\$459
1954	\$125,834	\$29,645	\$8,484	\$29,707	\$8,488	\$463
1955	\$170,829	\$41,445	\$12,353	\$41,681	\$12,366	\$553
1956	\$183,434	\$46,805	\$13,481	\$46,886	\$13,524	\$1,122
1957	\$192,861	\$47,658	\$13,844	\$48,509	\$13,848	\$925
1958	\$195,083	\$46,774	\$13,789	\$46,871	\$13,816	\$550
1959	\$253,644	\$64,221	\$19,500	\$64,372	\$19,548	\$1,804
1960	\$246,202	\$61,485	\$19,344	\$61,529	\$19,385	\$831
1961	\$296,261	\$79,058	\$23,562	\$79,422	\$23,613	\$2,455
1962	\$250,433	\$58,866	\$18,952	\$59,143	\$18,968	\$1,018
1963	\$308,438	\$71,846	\$23,819	\$71,971	\$23,822	\$296
1964	\$344,033	\$79,343	\$25,594	\$79,508	\$25,595	\$223
1965	\$363,759	\$84,479	\$28,365	\$84,600	\$28,375	\$250

Source: Center for Research in Security Prices, University of Chicago.

Firm Size and Return

Table 7-3 (continued)

**Size-Decile Portfolios of the NYSE/AMEX/NASDAQ**  
Largest and Smallest Company by Size Group

from 1966 to 2002

Date (Sept 30)	Capitalization of Largest Company (in thousands)			Capitalization of Smallest Company (in thousands)		
	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10	Mid-Cap 3-5	Low-Cap 6-8	Micro-Cap 9-10
1966	\$399,455	\$99,578	\$34,884	\$99,935	\$34,966	\$381
1967	\$459,170	\$117,985	\$42,267	\$118,329	\$42,313	\$381
1968	\$528,328	\$149,261	\$60,351	\$150,128	\$60,397	\$592
1969	\$517,452	\$144,770	\$54,273	\$145,684	\$54,280	\$2,119
1970	\$380,246	\$94,025	\$29,910	\$94,047	\$29,916	\$822
1971	\$542,517	\$145,340	\$45,571	\$145,673	\$45,589	\$865
1972	\$545,211	\$139,647	\$46,728	\$139,710	\$46,757	\$1,031
1973	\$424,584	\$94,809	\$29,601	\$95,378	\$29,606	\$581
1974	\$344,013	\$75,272	\$22,475	\$75,853	\$22,481	\$444
1975	\$465,763	\$96,954	\$28,140	\$97,266	\$28,144	\$540
1976	\$551,071	\$116,184	\$31,987	\$116,212	\$32,002	\$564
1977	\$573,084	\$135,804	\$39,192	\$137,323	\$39,254	\$513
1978	\$572,987	\$159,778	\$46,621	\$160,524	\$46,629	\$830
1979	\$661,336	\$174,480	\$49,088	\$174,517	\$49,172	\$948
	\$754,562	\$194,012	\$48,671	\$194,241	\$48,953	\$549
1981	\$954,665	\$259,028	\$71,276	\$261,059	\$71,289	\$1,446
1982	\$762,028	\$205,590	\$54,675	\$206,536	\$54,883	\$1,060
1983	\$1,200,880	\$352,698	\$103,443	\$352,944	\$103,530	\$2,025
1984	\$1,068,972	\$314,650	\$90,419	\$315,214	\$90,659	\$2,093
1985	\$1,432,342	\$367,413	\$93,810	\$368,249	\$94,000	\$760
1986	\$1,857,621	\$444,827	\$109,956	\$445,648	\$109,975	\$706
1987	\$2,059,143	\$467,430	\$112,036	\$468,948	\$112,125	\$1,277
1988	\$1,957,926	\$420,257	\$94,268	\$421,340	\$94,302	\$696
1989	\$2,147,608	\$480,975	\$100,285	\$483,623	\$100,384	\$96
1990	\$2,164,185	\$472,003	\$93,627	\$474,065	\$93,750	\$132
1991	\$2,129,863	\$457,958	\$87,586	\$458,853	\$87,733	\$278
1992	\$2,428,671	\$500,346	\$103,352	\$501,050	\$103,500	\$510
1993	\$2,711,068	\$608,520	\$137,945	\$608,825	\$137,987	\$602
1994	\$2,497,073	\$601,552	\$149,435	\$602,552	\$149,532	\$598
1995	\$2,793,761	\$653,178	\$158,011	\$654,019	\$158,063	\$89
1996	\$3,150,685	\$763,377	\$195,188	\$763,812	\$195,326	\$1,043
1997	\$3,511,132	\$818,299	\$230,472	\$821,028	\$230,554	\$480
1998	\$4,216,707	\$934,264	\$253,329	\$936,727	\$253,336	\$1,671
1999	\$4,251,741	\$875,309	\$218,336	\$875,582	\$218,368	\$1,502
2000	\$4,143,902	\$840,000	\$192,598	\$840,730	\$192,721	\$1,462
2001	\$5,252,063	\$1,114,792	\$269,275	\$1,115,200	\$270,391	\$443
2002	\$5,012,705	\$1,143,845	\$314,042	\$1,144,452	\$314,174	\$501

Source: Center for Research in Security Prices, University of Chicago.

Table 7-4

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, Summary Statistics of Annual Returns 1926-2002

Decile	Geometric Mean	Arithmetic Mean	Standard Deviation	Serial Correlation
1-Largest	9.4%	11.2%	19.44%	0.11
2	10.5	12.9	22.13	0.05
3	10.9	13.5	24.02	-0.01
4	11.0	14.0	26.26	0.00
5	11.1	14.5	27.06	0.00
6	11.3	14.9	28.11	0.06
7	11.1	15.2	30.33	0.02
8	11.3	16.2	34.03	0.06
9	11.5	17.1	36.90	0.07
10-Smallest	13.1	20.8	45.37	0.17
Mid-Cap, 3-5	11.0	13.8	25.08	-0.01
Low-Cap, 6-8	11.2	15.2	29.86	0.05
Micro-Cap, 9-10	12.1	18.2	39.32	0.10
NYSE/AMEX/NASDAQ Total Value-Weighted Index	9.8	11.8	20.48	0.05

### Aspects of the Firm Size Effect

The firm size phenomenon is remarkable in several ways. First, the greater risk of small stocks does not, in the context of the capital asset pricing model (CAPM), fully account for their higher returns over the long term. In the CAPM, only systematic or beta risk is rewarded; small company stocks have had returns in excess of those implied by their betas.

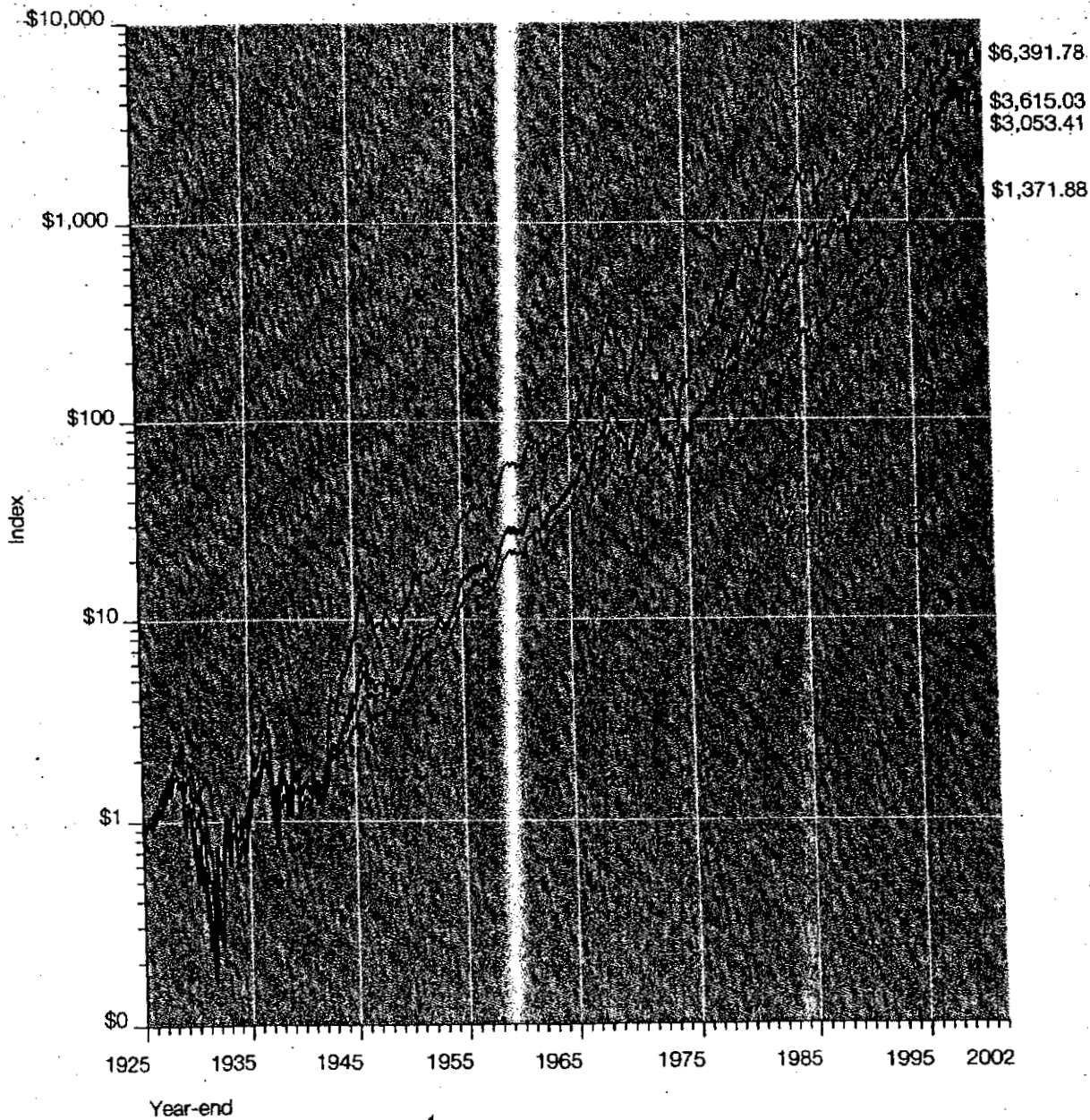
Second, the calendar annual return differences between small and large companies are serially correlated. This suggests that past annual returns may be of some value in predicting future annual returns. Such serial correlation, or autocorrelation, is practically unknown in the market for large stocks and in most other equity markets but is evident in the size premia.

Third, the firm size effect is seasonal. For example, small company stocks outperformed large company stocks in the month of January in a large majority of the years. Such predictability is surprising and suspicious in light of modern capital market theory. These three aspects of the firm size effect—long-term returns in excess of systematic risk, serial correlation, and seasonality—will be analyzed thoroughly in the following sections.

Graph 7-1

Size-Decile Portfolios of the NYSE/AMEX/NASDAQ: Wealth Indices of Investments in Mid-, Low-, Micro- and Total Capitalization Stocks  
1925-2002\*

\*Year-end 1925 = \$1.00



### Long-Term Returns in Excess of Systematic Risk<sup>2</sup>

The capital asset pricing model (CAPM) does not fully account for the higher returns of small company stocks. Table 7-5 shows the returns in excess of systematic risk over the past 77 years for each decile of the NYSE/AMEX/NASDAQ. Recall that the CAPM is expressed as follows:

$$k_s = r_f + (\beta_s \times \text{ERP})$$

Table 7-5 uses the CAPM to estimate the return in excess of the riskless rate and compares this estimate to historical performance. According to the CAPM, the expected return on a security should consist of the riskless rate plus an additional return to compensate for the systematic risk of the security. The return in excess of the riskless rate is estimated in the context of the CAPM by multiplying the equity risk premium by  $\beta$  (beta). The equity risk premium is the return that compensates investors for taking on risk equal to the risk of the market as a whole (systematic risk).<sup>3</sup> Beta measures the extent to which a security or portfolio is exposed to systematic risk.<sup>3</sup> The beta of each decile indicates the degree to which the decile's return moves with that of the overall market.

A beta greater than one indicates that the security or portfolio has greater systematic risk than the market; according to the CAPM equation, investors are compensated for taking on this additional risk. Yet, Table 7-5 illustrates that the smaller deciles have had returns that are not fully explainable by their higher betas. This return in excess of that predicted by CAPM increases as one moves from the largest companies in decile 1 to the smallest in decile 10. The excess return is especially pronounced for micro-cap stocks (deciles 9-10). This size-related phenomenon has prompted a revision to the CAPM, which includes a size premium. Chapter 4 presents this modified CAPM theory and its application in more detail.

This phenomenon can also be viewed graphically, as depicted in the Graph 7-2. The security market line is based on the pure CAPM without adjustment for the size premium. Based on the risk (or beta) of a security, the expected return lies on the security market line. However, the actual historic returns for the smaller deciles of the NYSE/AMEX/NASDAQ lie above the line, indicating that these deciles have had returns in excess of that which is appropriate for their systematic risk.

<sup>2</sup> The equity risk premium is estimated by the 77-year arithmetic mean return on large company stocks, 12.20 percent, less the 77-year arithmetic mean income-return component of 20-year government bonds as the historical riskless rate, in this case 5.23 percent. (It is appropriate, however, to match the maturity, or duration, of the riskless asset with the investment horizon.) See Chapter 5 for more detail on equity risk premium estimation.

<sup>3</sup> Historical betas were calculated using a simple regression of the monthly portfolio (decile) total returns in excess of the 30-day U.S. Treasury bill total returns versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926–December 2002. See Chapter 6 for more detail on beta estimation.



Firm Size and Return

Table 7-5

Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ 1926-2002

Decile	Beta*	Arithmetic Mean Return	Realized Return in Excess of Riskless Rate**	Estimated Return in Excess of Riskless Rate†	Size Premium (Return in Excess of CAPM)
1-Largest	0.91	11.25%	6.01%	6.34%	-0.32%
2	1.03	12.86%	7.63%	7.21%	0.42%
3	1.09	13.51%	8.28%	7.62%	0.66%
4	1.13	14.03%	8.80%	7.85%	0.95%
5	1.16	14.48%	9.25%	8.08%	1.16%
6	1.18	14.93%	9.70%	8.22%	1.48%
7	1.23	15.16%	9.92%	8.58%	1.35%
8	1.27	16.17%	10.94%	8.88%	2.06%
9	1.34	17.12%	11.89%	9.33%	2.56%
10-Smallest	1.41	20.75%	15.52%	9.85%	5.67%
Mid-Cap, 3-5	1.11	13.82%	8.59%	7.77%	0.82%
Low-Cap, 6-8	1.22	15.23%	9.99%	8.47%	1.52%
Micro-Cap, 9-10	1.35	18.20%	12.96%	9.44%	3.53%

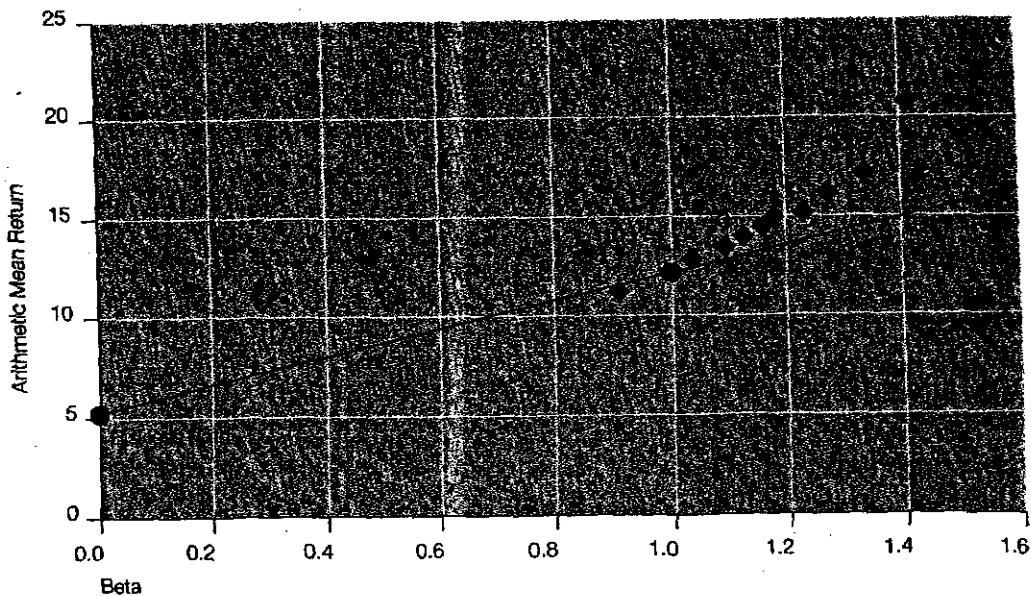
\*Betas are estimated from monthly portfolio total returns in excess of the 30-day U.S. Treasury bill total return versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926-December 2002.

\*\*Historical riskless rate is measured by the 77-year arithmetic mean income return component of 20-year government bonds (5.23 percent).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the S&P 500 (12.20 percent) minus the arithmetic mean income return component of 20-year government bonds (5.23 percent) from 1926-2002.

Graph 7-2

Security Market Line versus Size-Decile Portfolios of the NYSE/AMEX/NASDAQ 1926-2002



### Further Analysis of the 10th Decile

The size premia presented thus far do a great deal to explain the return due solely to size in publicly traded companies. However, by splitting the 10th decile into two size groupings we can get a closer look at the smallest companies. This magnification of the smallest companies will demonstrate whether the company size to size premia relationship continues to hold true.

As previously discussed, the method for determining the size groupings for size premia analysis was to take the stocks traded on the NYSE and break them up into 10 deciles, after which stocks traded on the AMEX and NASDAQ were allocated into the same size groupings. This same methodology was used to split the 10th decile into two parts: 10a and 10b, with 10b being the smaller of the two. This is equivalent to breaking the stocks down into 20 size groupings, with portfolios 19 and 20 representing 10a and 10b.

Table 7-7 shows that the pattern continues; as companies get smaller their size premium increases. There is a noticeable increase in size premium from 10a to 10b, which can also be demonstrated visually in Graph 7-3. This can be useful in valuing companies that are extremely small. Table 7-6 presents the size, composition, and breakpoints of deciles 10a and 10b. First, the recent number of companies and total decile market capitalization are presented. Then the largest company and its market capitalization are presented.

Breaking the smallest decile down lowers the significance of the results compared to results for the 10th decile taken as a whole, however. The same holds true for comparing the 10th decile with the Micro-Cap aggregation of the 9th and 10th deciles. The more stocks included in a sample the more significance can be placed on the results. While this is not as much of a factor with the recent years of data, these size premia are constructed with data back to 1926. By breaking the 10th decile down into smaller components we have cut the number of stocks included in each grouping. The change over time of the number of stocks included in the 10th decile for the NYSE/AMEX/NASDAQ is presented in Table 7-8. With fewer stocks included in the analysis early on, there is a strong possibility that just a few stocks can dominate the returns for those early years.

While the number of companies included in the 10th decile for the early years of our analysis is low, it is not too low to still draw meaningful results even when broken down into subdivisions 10a and 10b. All things considered, size premia developed for deciles 10a and 10b are significant and can be used in cost of capital analysis. These size premia should greatly enhance the development of cost of capital analysis for very small companies.

Table 7-6

Size-Decile Portfolios 10a and 10b of the NYSE/AMEX/NASDAQ,  
Largest Company and Its Market Capitalization  
September 30, 2002

Decile	Recent Number of Companies	Recent Decile Market Capitalization (in thousands)	Market Capitalization of Largest Company (in thousands)	Company Name
10a	584	\$49,010,627	\$141,459	NYMAGIC, Inc.
10b	1,314	\$38,115,236	\$64,767	Hartmarx Corp.

Note: These numbers may not aggregate to equal decile 10 figures.

Firm Size and Return

Table 7-7

Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ, with 10th Decile Split 1926-2002

	Beta*	Arithmetic Mean Return	Realized Return in Excess of Riskless Rate**	Estimated Return in Excess of Riskless Rate†	Size Premium (Return in Excess of CAPM)
1-Largest	0.91	11.25%	6.01%	6.34%	-0.32%
2	1.03	12.86%	7.63%	7.21%	0.42%
3	1.09	13.51%	8.28%	7.62%	0.66%
4	1.13	14.03%	8.80%	7.85%	0.95%
5	1.16	14.48%	9.25%	8.08%	1.16%
6	1.18	14.93%	9.70%	8.22%	1.48%
7	1.23	15.16%	9.92%	8.58%	1.35%
8	1.27	16.17%	10.94%	8.88%	2.06%
9	1.34	17.12%	11.89%	9.33%	2.56%
10a	1.42	19.11%	13.88%	9.90%	3.98%
10b-Smallest	1.40	24.13%	18.89%	9.73%	9.16%
Mid-Cap, 3-5	1.11	13.82%	8.59%	7.77%	0.82%
Low-Cap, 6-8	1.22	15.23%	9.99%	8.47%	1.52%
Micro-Cap, 9-10	1.35	18.20%	12.96%	9.44%	3.53%

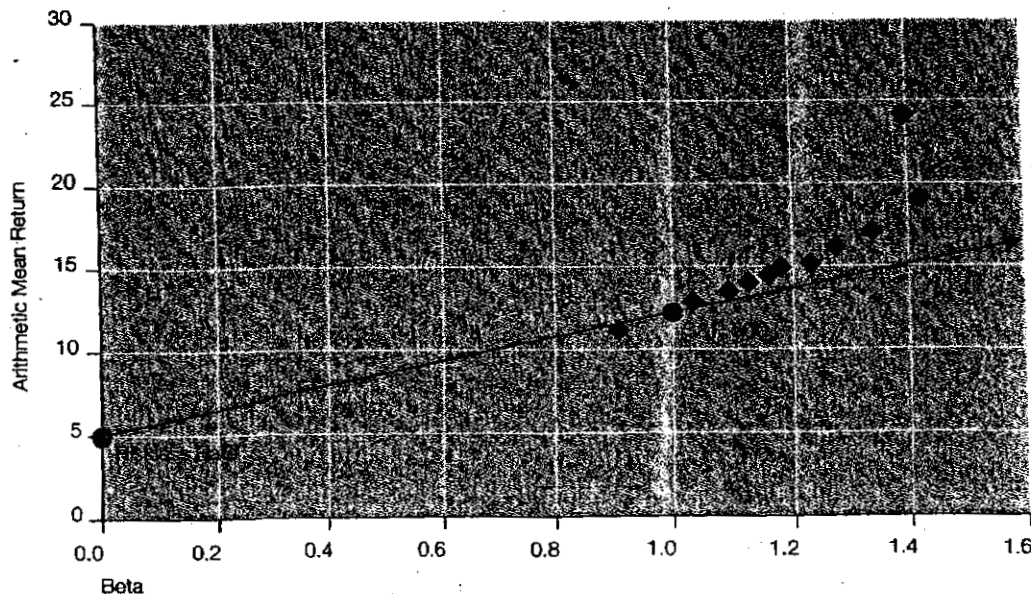
\*Betas are estimated from monthly portfolio total returns in excess of the 30-day U.S. Treasury bill total return versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926-December 2002.

\*\*Historical riskless rate is measured by the 77-year arithmetic mean income return component of 20-year government bonds (5.23 percent).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the S&P 500 (12.20 percent) minus the arithmetic mean income return component of 20-year government bonds (5.23 percent) from 1926-2002.

Graph 7-3

Security Market Line versus Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, with 10th Decile Split 1926-2002



**Table 7-8**  
**Historical Number of Companies for NYSE/AMEX/NASDAQ Decile 10**

Sept.	Number of Companies
1926	52*
1930	72
1940	78
1950	100
1960	109
1970	865
1980	685
1990	1,814
2000	1,927
2002	1,994

\*The fewest number of companies was 49 in March, 1926

#### Alternative Methods of Calculating the Size Premia

The size premia estimation method presented above makes several assumptions with respect to the market benchmark and the measurement of beta. The impact of these assumptions can best be examined by looking at some alternatives. In this section we will examine the impact on the size premia of using a different market benchmark for estimating the equity risk premia and beta. We will also examine the effect on the size premia study of using sum beta or an annual beta.<sup>4</sup>

#### Changing the Market Benchmark

In the original size premia study, the S&P 500 is used as the market benchmark in the calculation of the realized historical equity risk premium and of each size group's beta. The NYSE total value-weighted index is a common alternative market benchmark used to calculate beta. Table 7-9 uses this market benchmark in the calculation of beta. In order to isolate the size effect, we require an equity risk premium based on a large company stock benchmark. The NYSE deciles 1-2 large company index offers a mutually exclusive set of portfolios for the analysis of the smaller company groups: mid-cap deciles 3-5, low-cap deciles 6-8, and micro-cap deciles 9-10. The size premia analyses using these benchmarks are summarized in Table 7-9 and depicted graphically in Graph 7-4.

For the entire period analyzed, 1926-2002, the betas obtained using the NYSE total value-weighted index are higher than those obtained using the S&P 500. Since smaller companies had higher betas using the NYSE benchmark, one would expect the size premia to shrink. However, as was illustrated in Chapter 5, the equity risk premium calculated using the NYSE deciles 1-2 benchmark results in a value of 6.24, as opposed to 6.97 when using the S&P 500. The effect of the higher betas and lower equity risk premium cancel each other out, and the resulting size premia in Table 7-9 are slightly higher than those resulting from the original study.

<sup>4</sup> Sum beta is the method of beta estimation described in Chapter 6 that was developed to better account for the lagged reaction of small stocks to market movements. The sum beta methodology was developed for the same reason that the size premia were developed; small company betas were too small to account for all of their excess returns.